# Materials Engineering Branch

# TIP*

## No. 016 Sputtered $MoS_2$ Lubricant Films

Author(s): Charles Vest Contact: (301) 286-6882

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Molybdenum disulfide ($MoS_2$) is a good solid film lubricant for vacuum applications. It is not especially good for applications in air. One of the means by which it can be applied to metal substrates that need to be lubricated in vacuum is by DC or RF sputtering. This process applies a relatively thin (2000-4000Å) film of $MoS_2$ to the surface that was bombarded by argon ions in a cleaning step prior to sputtering.

Adhesion of the film to the substrate is excellent and very little debris is generated in vacuum operation so that run-in or burnishing are not required as with the thicker bonded-on films. Because the film is so thin, its tolerance to operation in air is low and wear-through can easily occur. The film is sometimes used in ball bearings along with a reinforced Teflon ball cage to provide Teflon transfer lubrication as a backup.

When the $MoS_2$ films are stored in air, they should be inspected for molybdenum oxide or the mechanism should be periodically operated to verify that any oxide that is formed does not increase the friction or cause mechanism malfunction.

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